ABSTRACT OF THE DISCLOSURE

A regenerable, high-capacity sorbent for removal of mercury from flue gas and processes and systems for making and using the sorbent. A phyllosilicate substrate, for example vermiculite or montmorillinite, acts as an inexpensive support to a thin layer for a polyvalent metal sulfide, ensuring that more of the metal sulfide is engaged in the sorption process. The sorbent is prepared by ion exchange between the silicate substrate material and a solution containing one or more of a group of polyvalent metals including tin (both Sn(II) and Sn(IV)), iron (both Fe(II) and Fe(III)), titanium, manganese, zirconium and molybdenum, dissolved as salts, to produce an exchanged substrate. Controlled reaction of a sulfide ion source with the one or more polyvalent metals that are exchanged on the silicate substrate produces the sorbent. The sorbent is used to absorb elemental mercury or oxidized mercury species such as mercuric chloride from flue gas containing acid gases (e.g., SO_2, NO and NO_2, and HCl) and other gases over a wide range of temperatures.